National Aeronautics and Space Administration

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The Greening of the Shuttle

Marrying sustainability and high performance, the Space Shuttle Program couples the exploration of space with the protection of the Earth's environment. This display celebrates some of NASA's many achievements in greening the Space Shuttle through science, engineering, and technology design.

Freon Free

Freon 113, a member of the chlorofluorocarbon family, is used in many cleaning solvents, but its long half-life in the stratosphere makes it a particularly potent ozone depleter. The Space Shuttle Program now uses cleaning solvents with HFE-7100 in place of Freon 113-based cleaners for manual cleaning operations whenever possible. HFE-7100 has less impact on the ozone.

Laser Stripping

Sometimes the best replacement for a hazardous chemical is not another chemical but new technology. A portable laser coating removal system is being tested as an alternative to chemical paint strippers or media blasting, both of which create hazardous wastes. At present, it is best suited for use on small areas such as removing the bonding agent on the Shuttle's thermal protection tiles.

Sooo . . . Clean

Because liquid oxygen is highly reactive, any surfaces that come in contact with it must be free of particulates and residues that could ignite and cause an explosion. Chemicals in the chlorofluorocarbon family are safe to use in cleaning systems for liquid oxygen service but contribute to ozone depletion. One such compound, CFC 113, which was used to clean the external tank, has been replaced with HCFC 225. HCFC 225 is compatible with liquid oxygen and reduces environmental impact.

A New Paint Job

When paint is applied as a seal coat over the solid rocket boosters' thermal protection system (TPS), a chemical in the paint, perchloroethylene, soaks into the TPS material. Because this chemical is an air pollutant and carcinogenic, the TPS material must be disposed of as hazardous waste material. To eliminate this problem, a new paint formulation that does not contain perchloroethylene is scheduled for implementation this year.

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